# BILL BARRETT CORPORATION'S
# WEST TAVAPUTS NATURAL GAS DEVELOPMENT PROJECT

# PRELIMINARY
# PROPOSED ACTION

**October 2005**

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## Introduction and Summary

Bill Barrett Corporation (BBC) and other oil and gas operators propose to develop the oil and gas resources of the West Tavaputs Plateau area in Duchesne and Carbon Counties, Utah, approximately 30 miles east-northeast of Price, Utah (Figure 1). The project area for the project is bounded on three sides by natural features – on the west by Sheep Canyon, on the north by Nine Mile Canyon, and on the east by the Green River. The southern boundary of the area is a straight line reflecting an anticline in the sub-surface that limits the southern extent of the natural gas resources targeted by the project. Surface ownership in the 137,700-acre project area is approximately 87% federal (managed by the Bureau of Land Management [BLM]), 8% State of Utah (managed by State of Utah School and Institutional Trust Lands Administration [SITLA]), and 5% private (Figure 2). Mineral ownership closely parallels surface ownership.

The Proposed Action is preceded by three oil- and gas-related operations/actions in the project area. They are the Stone Cabin 3-D Seismic Survey Project, analyzed in an EA (UT-070-2003-15) and approved by BLM on April 2, 2004; the West Tavaputs Plateau Drilling Program, analyzed in an EA (UT-070-2004-28) and approved by BLM on July 29, 2004; and the Burris 1-10 well and right-of-way EA approved by the BLM in 1999 (UT-066-97-55). Those EAs evaluated impacts from seismic exploration and exploratory drilling projects designed to identify oil and gas resources within the project area.

The project area includes the Desolation Canyon and Jack Canyon Wilderness Study Areas (WSA). Drilling is planned in the WSAs on several leases issued prior to the Federal Land Policy and Management Act of 1976 (FLPMA). The project area encompasses about 24,660 acres within the Desolation Canyon WSA and 7,342 acres within the Jack Canyon WSA. The proposed action includes up to 43 proposed well pads, 15.7 miles of access road, and one compressor station within the WSA. The project area also involves two federal oil and gas units, the Peters Point and Prickly Pear Units in Townships 11-13 South, Ranges 13-18 East, Salt Lake Meridian.

**Table 1. Surface Ownership.**

| | Surface Ownership | |
|---|---|---|
| | **Acres** | **Percent of Total** |
| **Federal (BLM)** | 119,799 | 87 |
| **State of Utah** | 11,016 | 8 |
| **Private (Fee)** | 6,885 | 5 |
| **Total** | 137,700 | 100 |

In Figure 2, BBC has indicated the preliminary locations of potential well pads over the area currently thought to be most prospective for natural gas development. Five hundred well pads are illustrated on Figure 2, from which up to 750 downhole locations might be drilled. The prospective nature of the area identified for drilling is based on 3D seismic data, geologic information, and data derived from wells drilled to date. These data are limited for large portions of the project area. BBC expects that a significant proportion of the prospective area would ultimately prove to produce enough natural gas to be economically productive. BBC also expects that broad areas currently identified as prospective and over which potential wells are sited on Figure 2, would not be economically productive, and thus, many of the illustrated wells would not be drilled.

Similarly, geologic characteristics that are currently poorly defined and which would be better defined through future drilling, would dictate the well density necessary to effectively drain the natural gas. Some of the economically productive areas would likely be effectively drained by well densities of one well per 160 acres, others would likely require well densities of up to one well per 40 acres. In general, deeper formations require lesser well density. The number of wells per well pad would therefore vary dramatically, depending on the required well density as well as topographic considerations. Areas that can be produced by a single well per 80 acres, that are accessible, and that have a single production formation, would be developed by well pads with a single well bore. Areas that require well densities of one well per 40 acres, that are adjacent to topographically inaccessible lands, and that have multiple productive horizons would be developed using multiple well pads with up to 8 wells per pad. Thus, the 500 well pads and 750 downhole locations should be considered statistically derived, theoretical and conceptual maximums that likely would not be approached by the actual development. However, for the purposes of surface disturbance estimation, construction of all 500 well pad locations and their associated access roads and pipelines has been presumed.

While the proposed well pad locations shown have not been individually inspected, they were preliminarily located on Figure 2 with respect to steep topography and vegetation and, based on experience operating in the area, are feasible to construct. An inspection of individual locations by BLM and BBC personnel would occur at the time individual wells are permitted and final adjustment to location and orientation made. Site-specific Best Management Practices (BMPs) for siting locations, as described in BLM Instruction Memorandum No. 2004-194: Integration of Best Management Practices into Application for Permit to Drill Approvals and Associated Rights-of-Way, would be applied at the time of these site inspections. Such BMPs could include, in addition to directional drilling, avoidance of physiographic features, protection of specific vegetation and habitats, and visual resource mitigation.

Figure 3 provides a typical stratigraphic section for the project area. Wells would be drilled to all potentially productive formations in the West Tavaputs Plateau area - the Wasatch, Mesa Verde, Dakota, Cedar Mountain, Navajo, and Wingate Formations and other formations found to be productive. Maximum downhole well density is expected to be 40 acres for the Wasatch and Mesa Verde Formations and 80 acres for the other formations. Although multiple formations are targeted, well pads would be shared, that is, wells for multiple formations would originate at the same well pad to minimize surface impacts.

Although surface density of one well per 40 acres would be economically optimal, BBC proposes one well per 80 acres or less. This is partly because wells for multiple formations with 40 and 80-acre downhole densities would share well pads. In addition, many downhole locations would not be accessible using vertical well bores due to steep topography and could only be accessed using directional drilling. In general, BBC proposes to directionally drill wherever feasible to minimize surface disturbance. Well pads in the canyons would be limited to those locations where the gas resources cannot be recovered by directional drilling methods from the canyon rims. It is anticipated that more than half of the well pads would have more than one well and some would have up to eight.

BBC's proposed drilling plan fully exploits technology that is available today. Directional drilling techniques are constantly evolving, however, using current directional drilling technology and considering the geologic characteristics of the area, the maximum horizontal offset between a surface and downhole location is approximately 2,000 feet. As drilling technology evolves to allow greater horizontal offset between surface and downhole locations, certain well locations would likely be dropped.

Because of the extended drilling or completion process for deep or directionally drilled wells, multiple wells from a single well pad and wells developing deeper horizons often cannot be drilled and completed within the period that is free of seasonal wildlife closures. It is not practical or safe to interrupt the drilling and completion process and resume operations after several months. For example, if deep well drilling were interrupted at certain points in the process, the well bore would have to be plugged to prevent the potential for blowout, effectively nullifying much of the drilling progress. The interruption of drilling and completion activities, and the consequential numerous rig mobilizations and demobilizations would impact traffic at the times of the year most important to recreational traffic. It would also decrease the rate at which the West Tavaputs Plateau gas resources are developed by 33% to 50%. By decreasing the rate at which the project area's gas resources are developed, the life of the project and associated impacts from traffic, equipment emissions, etc. would increase accordingly. Furthermore, the ultimate recovery of the gas resources could be negatively impacted if drilling or completion operations are interrupted at certain points in the process due to well bore damage related to leaving drilling and completion fluids in contact with the formation for extended period of time. BBC is therefore, proposing to identify, on an annual basis, well pads from which wells would be drilled on a year-round basis. BBC would consult with the Utah Division of Wildlife Resources (UDWR) and BLM to identify multi-well and deep well locations where year-round drilling would have the least impact on wildlife and those locations would be targeted for year-round drilling. BBC is proposing that up to three drill rigs would be active over the winter period. BBC is also proposing to mitigate wildlife impacts through habitat improvements or other efforts as defined through consultation with UDWR and BLM.

Three to six drill rigs would be operating for up to 20 years, drilling as many as 70 wells in a year. The anticipated life of a well is approximately 20 years. The life of the project (LOP) is about 40 years. Figure 2 also shows the location of ancillary facilities including roads and pipelines, compressors and injection wells. As is the case for the well pads, the conceptual locations of ancillary facilities have not been individually inspected. Final location of facilities would be subject to BMPs for siting facilities and would comply with BLM visual resource stipulations on BLM-administered land.

Development of the oil and gas resources on the West Tavaputs Plateau has been ongoing since the 1950's. As of 08/26/05, 71 gas wells have been drilled within the project area; 37 of these wells are currently producing and 34 wells have been temporarily or permanently abandoned. About 30 more exploratory wells, analyzed in the West Tavaputs Plateau Drilling Program Environmental Assessment (EA) (UT-070-2004-28), are approved. Drilling of these approved, exploratory wells and potential additional exploratory wells conducted and analyzed under NEPA interim action guidelines, would occur while the EIS for the proposed development is underway.

Recoverable gas in place over the development area may be up to approximately 1,000 billion cubic feet (BCF). The peak production rate resulting from the proposed action is 250 million cubic feet per day. Additional production information can be found in the Production Operations Section.

## Proposed Action

Earthwork

Construction of a typical well pad entails the use of crawler tractors, motor graders, Class 125 or larger track hoes, backhoes, 10 to 20-yard dump trucks, and Class 988 loaders. Equipment needs would vary depending on site-specific conditions.

A crawler tractor would strip whatever topsoil is present and stockpile it along the edge of the well pad for use during reclamation. Brush would be distributed along the sides of the well pad. Diversion ditches and berms may be constructed with a motor grader to prevent erosion from runoff. Prior to drilling operations, a fenced cuttings/mud pit would be excavated adjacent to the working area of the well pad by a track hoe. The pit would be lined with an impermeable geosynthetic liner. Fill from the pit would be stockpiled along the edge of the pit and the adjacent edge of the well pad. The well pad would be constructed to minimize erosion. In addition, erosion control practices would be followed during construction and operation of the well pad. Energy dissipaters such as earthen berms, straw bales, rock gabions, and silt fences would be used as appropriate in areas where the possibility of erosion exists.

On average, four to six employees, mostly equipment operators, would work on construction of a well pad. Construction of an individual well pad could take from one to three weeks depending on the features of the particular sites.

Figure 4 represents a typical well pad layout. Each well pad would initially disturb about 2.75 acres (approximately 300 x 400 ft), depending on the amount of cut and fill. Well pads for directionally drilled wells would be built the same as the well pads for vertical wells but enlarged by approximately 0.2 acres for each additional directional well to be drilled. Additional well bores on multi-well pads would be offset in a line 15 to 20 feet from the previous well bore. This additional disturbance would accommodate the drilling equipment while providing a safe offset from the existing well bore. The reserve/cuttings pit would be fenced on three sides during drilling and on the fourth side after completion. The well pad itself would not be fenced. Initial surface disturbance resulting from the construction of up to 500 well pads would be up to 1,375 acres. However, as described in the project summary, the 500 well pad count illustrated on Figure 2 likely would not be reached by the actual development. However, for the purposes of impact analysis, all 500 well pad locations and the associated roads, pipelines, and facilities have been used for surface disturbance calculations.

Development of the West Tavaputs Plateau would require construction and improvement of up to 148 miles of road on federal and SITLA surface. Road improvements and new road construction would only occur on an as-needed basis to facilitate access to drilling locations.

Road upgrades would include increasing the radius of identified tight corners, widening narrow portions of road, upgrading surface materials, and improving drainage where necessary. As appropriate, new road construction and road upgrades would follow the BLM road guidelines established for oil and gas exploration and development activities in the BLM/U.S. Forest Service (USFS) publication *Surface Operating Standards for Oil and Gas Exploration and Development* (Third Edition), often referred to as the Gold Book, and pending updates thereto; in *BLM Manual Section 9113;* and in the BLM Price Field Office's *Hydrological Modification Standards for Roads* (publications available at the BLM Price Field Office). Figure 5 displays a typical road cross section.

Improvements of existing roads and new construction would typically require the use of motor graders, crawler tractors, 10-yard end dump trucks, and water trucks. The standard methodology for building new roads involves a crawler tractor or trackhoe to windrow the vegetation to one side, to remove topsoil to the opposing side, and to rough-in the roadway. This would be followed with a grader or bulldozer to establish borrow ditches and crown the road surface. If culverts were required, a track hoe or backhoe would trench the road and install the culverts. Some hand labor would be required when installing and armoring culverts. Any road base or gravel needed would be hauled in and a grader used to smooth the running surface.

Aggregates for road surfacing would be obtained from new aggregate borrow areas or quarries on SITLA lands within the project area. Up to one two-acre quarry would be developed on each of the three mesas within the project area, for a total of six acres of disturbance due to quarries.

Roads on the top of the mesa would be constructed at a rate of approximately 1.5 miles per day. Roads constructed or upgraded in steep terrain would require more time to complete. Roads would be constructed immediately prior to well pad construction. The work force would include four to six employees to operate the equipment. Several crews could operate simultaneously on different roads or different portions of the same road.

Roads would generally be constructed to either a Resource Road or Collector Road standard (Gold Book) with a 12 to 24-foot running surface composed of a base overlaid with aggregate, as needed. A 60-foot wide ROW would be needed for road construction. The surface would have a crown to facilitate drainage to a borrow ditch designed to minimize erosion potential. Where possible, grades would be less than 8% and minimum curve radius would be 100 feet. The roads would have a design speed of 15 to 30 miles per hour. Initial surface disturbance resulting from the construction of new access roads would be up to 538 acres. However, as described in the project summary, the 500 well pad count illustrated on Figure 2 likely would not be reached by the actual development. However, for the purposes of impact analysis, all 500 well pad locations and their associated access roads have been used for surface disturbance calculations. Consequently, fewer than 148 miles of access road construction would likely be realized.

Project roads would require routine year-round maintenance to provide year-round access, particularly during wet conditions. Depending on road moisture conditions, the roadways would be watered or treated with magnesium chloride, enzymes, or other approved dust suppressants to control dust and to facilitate grading. A motor grader would clean the borrow ditches, widen sluff areas, and smooth the road surface as necessary. The road surface in low areas, excessively rocky areas, or incised areas would be treated with aggregate.

Drilling and Completion

Site-specific descriptions of drilling procedures would be included in the *Application for Permit to Drill* (APD) submitted to BLM by operators for each proposed well. A typical APD for the West Tavaputs Plateau area, including a Drilling Plan and Surface Use Plan, is found in Appendix A. Mud rotary platform drilling rigs with capability matched to the depth requirements of individual wells would be utilized. The rig used for shallow wells would be smaller than a rig used for deeper wells, incorporating a smaller substructure and mast and thus a smaller surface disturbance footprint. Information relative to size of bore, depth of drilling, casing, cementing, etc. would be available in the APDs at the BLM Price and Moab Field Offices.  Figure 6 shows typical well bore construction for deep and shallow wells. Casing and cement are used to isolate fresh water aquifers from drilling and completion fluid.

Shallow wells would require approximately four weeks per well for drill rig setup, drilling, and rig takedown.  Deep wells would require up to 120 days to complete.  Typically, three to six drilling rigs may be operating in the area at any one time.

Drilling engines would be muffled to minimize noise.  Generator-driven lights would be installed on the substructure and mast to light the site for night drilling and safety of workers.

Directional drilling activities would be similar to those described above except that directional wells would require more resources and could take up to twice as long to drill.   However, the amount of traffic associated with a rig move for subsequent wells off of a single well pad would be essentially eliminated.

Once a well has been drilled, completion operations would begin.  Well completion involves setting casing to depth and perforating the casing in target production zones, followed by fracturing (fracing) the formation by injecting an agent (i.e., water and $CO_2$) into the formation under pressure.  The fracing material would likely contain sand or other proppant to keep the fractures from closing, thereby allowing gas to be produced from the formation.  The next phase would be to flow and test the well to determine rates of production.  Depending upon the concentration of water and proppant in the flow from the well, and the availability of a gas transportation pipeline, this “test” gas would either be flared or sold down the pipeline.

Most completion procedures would be completed using a truck-mounted work-over rig. The work-over rigs are lighter and smaller in stature, allowing them to be transported on a single truck.  Some well completions would be rigless, requiring only a wire-line truck to perforate the casing.

Completion of an individual well may take only three to six days, but would occur over a three to 20 day period, depending on conditions at the individual well.  Completion procedures on deeper wells would require additional time (approximately 30 to 90 days) depending on the number of completion zones. An average of 145 vehicle roundtrips per well would be required.

Flare lines would be directed so as to avoid environmental damage and as required by regulations.  Flare lines would be in place on all well locations; however, in the event it becomes necessary to flare a well, a deflector and/or directional orifice would be used to safeguard both personnel and adjacent natural rock faces.

Interim Reclamation

Following well completion, interim reclamation would be pursued on the portions of the well pad not needed for production equipment and operations. On average, the production pads would be reduced to one acre in size or less. Access road and pipeline ROWs would also be reduced in width to a 30-foot working ROW and the remaining 30-foot width would be reclaimed. A reclamation plan will be prepared and submitted during the EIS process. In general, reserve pits would be reclaimed within one year of well completion or when free of fluids. The portion of the pit liner above grade would be cut and removed and the rest of the liner would be ripped. Material remaining in the reserve pit would be mixed to promote stability and drainage. The reserve pits and those portions of the well pad not needed for production would then be re-contoured to promote proper drainage, salvaged topsoil would be replaced, and sideslopes would be ripped or disked on the contour. The recontoured area would then be fertilized and reseeded during the first fall season after well completion. Reclamation of well pads from which directional wells were drilled would be implemented within six months after all well bores on the pad were drilled and completed.

Interim reclamation would include repair of range management facilities and improvements that had been altered by project-related activities, for example, the installation of cattle guards where new access roads crossed allotment fences.

Production Operations

If a well is determined to be commercially productive, production facilities would be installed on the well pad. Usually, one or two 200 to 400 barrel (bbl) storage tanks would be installed if formation water or condensate were produced. The tanks would be drained as necessary and the water transported to an approved disposal site. Natural gas condensate would be transported to a sales facility. Typically, a heated 3-phase separator, rated at 0.5 MMBtu/hour would be associated with each well bore.

Dehydration facilities to separate water from natural gas would be centralized at compression facilities. Approximately 25% of the well pads may have individual dehydrators. A heated dehydrator reboiler rated at 0.5-1.0MMBtu/hour would be located at each individual well facility.

Most wells would be fitted with plunger lift systems to assist liquid production. Some well pads may have pump jacks installed if liquid volume and/or low formation pressures require it. Plunger lift systems do not require any outside source of energy. Pump jacks would be gas powered.

Production facilities for locations that include directionally drilled wells would be similar to those at single well pads. Additional production equipment and holding tanks may be required but production from directionally drilled wells would use the same gathering pipeline installed for the original well.

During production, wells would typically be visited once daily by one worker driving a standard pick-up truck to the well pads for visual inspection of equipment, gauges, etc. Water and condensate would be trucked from the location in 80 bbl loads on dual-axle trucks. Well maintenance activities would occur on a year-round basis.

Existing wells in the West Tavaputs Plateau area currently produce one to three million cubic feet of gas per day (mmcfd) (an average of 1 mmcfd), zero to 10 barrels per day (bbl/d) of condensate (3 bbl/d typical), and zero to 80 bbl per day of water (15 bbl/d average). These figures for current production are higher than the average for the life of a well would be since production typically declines over time. Table 2 displays the rates of natural gas, condensate and water production expected from wells in the Proposed Action drilled to different formations. As the table shows, natural gas production rates may vary greatly depending on the formations producing in each well and the stage in a well's life.

**Table 2. Natural Gas, Condensate and Water Production Rates**

| Formation | Natural Gas Production | | | Condensate (bbls/day) | Water (bbls/day) |
|---|---|---|---|---|---|
| | Initial Production | Average Rate/Day | Ultimate Recovery | | |
| **Wasatch** | 1.5MM | 137M | 1.0B | 1 | 8 |
| **Mesa Verde** | 1.0MM | 192M | 1.4B | 5 | 17 |
| **Deep *** | 5.0MM | 822M | 6.0B | 15 | 15 |

* Dakota, Cedar Mountain, Navajo, and Wingate. Estimates are based on similar production from the Hill Creek area.
M=thousand cubic feet, MM=million cubic feet, B=billion cubic feet

All security guidelines identified in 43 *Code of Federal Regulations* (C.F.R.) 3162.7-5 and *Onshore Oil and Gas Order No. 3* would be followed. All permanent structures constructed or installed would be painted a flat, non-reflective standard environmental color as determined by the Authorized Officer (AO). Facilities would be painted within six months following installation. Some equipment may not be painted for safety considerations as required by the Occupational Safety and Health Administration (OSHA). All gas flow lines and gathering lines would be buried or laid on the surface from production equipment to beyond the gas meter.

Workovers

Periodic workovers would be required to correct downhole problems in a producing well and to return the well to production. Workovers would not be undertaken on a set schedule but rather on an as-needed basis to increase or maintain production from the current downhole-producing zone or to re-complete in a new zone.

A well would require a workover for any of several typical reasons including:

- refracturing producing formation(s) using advanced techniques designed to stimulate additional production;
- cleaning out the well bore and perforations to stimulate/facilitate production; and
- possibly "re-completing" in another potentially productive zone that was not originally completed at the time the well was drilled.

A workover would require, on average, a crew of three workers for four days. Workover activities would typically be implemented during daylight hours only.

Final Reclamation and Abandonment

When a well is to be plugged and abandoned, BBC would submit a *Notice of Abandonment* to the BLM. The BLM would then attach the appropriate surface rehabilitation conditions of approval for the well pad, and as appropriate, for the associated access road, pipeline, and ancillary facilities. Back filling, leveling, and re-contouring would be performed as soon as practicable after cessation of production and completion operations and removal of structures. The area would be re-seeded with an appropriate seed mix, specifically designed to simulate adjacent undisturbed vegetation, while maximizing utilization by both wildlife and domestic stock.

Pipelines

New pipelines would be necessary to transport gas from producing wells in the project area to the existing sales gas pipeline operated by Questar Pipeline. BBC's current gathering system on the plateau would be expanded to convey the production volumes expected from new wells. Figure 2 displays existing and proposed pipelines. The proposed gathering system, including compression, would be designed so that it would convey the expected well production rate but also so that capacity could be expanded if all of the wells produce at the upper end of their potential range.

New pipelines would be constructed of steel and buried or placed on the surface. The decision to bury a segment of pipeline versus lay it on the surface would be based on site-specific conditions and BLM policies at the time the Record of Decision is issued. Both the steep terrain of the canyon walls between the plateau and canyon bottoms and the shallow depth to bedrock on the plateau would limit the feasibility of buried lines in certain areas. In general, pipelines would be installed adjacent to well access roads and would not result in additional surface disturbance but in limited situations, for example to significantly reduce total pipeline length, a pipeline ROW would be located independent of the access road to improve gathering system efficiency. Pipelines installed independent of roads could total approximately eight miles. Surface disturbance from new pipeline constructed independent of access roads would require an 60-foot wide construction ROW, resulting in approximately 29 acres of initial surface disturbance. Each independent pipeline ROW would be reclaimed within six months of pipeline installation, with the exception of the immediate area of disturbance underneath the surface pipeline, resulting in almost no long-term disturbance. Most pipeline upgrading would be accomplished by looping (i.e., installing new pipelines parallel to, and in the same ROW as existing pipelines) and by adding compression.

Surface pipelines adjacent to roads would be assembled on the roadway, lifted with a sidebar crawler or track hoe, and placed in the existing vegetation with minimal disturbance. Buried pipelines would be installed using the following general construction sequence:

- Vegetation would be scalped and windrowed to one side of the ROW.
- A total of six to eight inches of topsoil would be removed and windrowed to one side.
- A trench approximately four-feet deep would be dug and the soil stockpiled to one side, making sure the topsoil and spoil do not get mixed together.

- The pipeline would be installed, the trench backfilled, and the spoil compacted in the trench.
- Stockpiled topsoil would be placed over the compacted spoil to facilitate reclamation.
- Scalped vegetation would be placed back on the ROW using a motor grader.
- The entire ROW would be reseeded in the first appropriate season after disturbance.

All pipelines would be constructed to applicable American Petroleum Institute (API) / industry standard.

Compressor Stations

Additional compression of 3,600 to 4,800 total horsepower (hp) may be installed on each of the three mesas in the project area and at the existing Dry Canyon facility (Figure 2). Each compressor station would occupy an approximate 5-acre site, resulting in a total of 15 acres of surface disturbance. The total horsepower requirement would depend on the production of the proposed wells. Based on a peak field production estimate of 250 MMscfd, approximately 35,000 compression horsepower would be added to the existing system. BBC is proposing either natural gas-fired internal combustion engines or electric motors as prime movers for the compression. If electrical compressors were used, a new overhead electrical service (powerline) would be required. The service for power would originate near the Soldier Canyon Mine, southwest of the Project Area. The exact route for the proposed powerline would be highly dependent on site-specific conditions, and therefore, has not yet been determined nor is it illustrated on Figure 2. Emissions from natural-gas fired compressors at the facilities would typically be less than two grams per hp/hour of CO and $NO_X$ and less than one gram per hp/hour of VOCs. Dehydrator reboilers rated at a total of 1-2MMBtu/hour would typically be located at the centralized compressor facilities. Dehydrator emissions would be controlled.

Produced Water Management

Produced water would be either transported to commercial disposal sites, injected into disposal wells (likely located at centralized facilities), recycled for use in drilling and completion operations, or treated and discharged under approved National Pollution Discharge Elimination System (NPDES) permits. Water would be transported from producing wells to injection/treatment facilities via water pipelines paralleling gas pipeline ROWs and/or by truck. Pipelines would typically follow road ROWs but may occasionally follow an alternative route to improve gathering system efficiency. Between three and six injection well facilities could potentially be located in the project area. Injection wells would be drilled to non-producing, non-potable water bearing formations that are capable of accepting water. Each injection well facility would occupy an approximate three-acre site, for a total of up to 18 acres of surface disturbance if all six wells were constructed.

Access and Traffic

County Road 53 (Nine Mile Canyon) would be the primary access from Wellington, whereas Gate Canyon to its junction at Nine Mile Canyon would serve as the access from Vernal. No reconstruction or upgrades of the main access roads would be required. Aircraft, using the Peter's Point airstrip, would be used periodically to bring crews and materials to the field.

Table 3 describes potential daily traffic volumes that may occur during different phases of the proposed action, assuming either one rig or six rigs were active in the area. The figures in Table 3 represent average approximations. Actual traffic volumes would vary depending on the level of drilling activity, the specific operations that might be underway at a well pad, and the maturity of the project at any particular time. Traffic for well completion, for example, would average 15 round trips per day over the entire process but on any single day might require 30 roundtrips between the project area and nearby cities and towns. Additional traffic would occur periodically when new sections of the pipeline gathering system are under construction, at which time an additional 10 to 25 trips daily would take place. Traffic associated with production operations and well service would depend on the number of producing wells at any one time. Production operations traffic would grow over time as the number of producing wells increase and would begin to peak at the time that traffic related to development declines.

**Table 3. Average Daily Traffic Estimates**

| Activity | | Earthwork* | Drilling | Completion | Total |
|---|---|---|---|---|---|
| **One Rig** | Automobile/Light Truck | 4 | 24 | 15 | 35 |
| | Heavy Truck | 2 | 2 | 8 | 12 |
| **Six Rigs** | Automobile/Light Truck | 12 | 72 | 45 | 141 |
| | Heavy Truck | 6 | 12 | 24 | 42 |

* Earthwork includes construction of well pads and associated access roads, pipeline corridors, and compressor stations.

In general, public use of area roads would not be interrupted during the construction, drilling, or operation of well pads and facilities. However, there may be times when traffic may need to be controlled on specific sections of road for short durations (estimated at less than one hour) out of operational necessity, for example, during rig and heavy equipment transportation on steep canyon roads. Traffic would be controlled using roadside signs, flagmen, and barricades as appropriate.

To address safety-related traffic concerns, all drivers and rig crews would be advised of the hazards to recreational traffic along the access roads, as well as hazards present due to blind corners, cars parked on the road, pedestrian traffic, mountain bikers, etc. In addition, appropriate signs would be erected to warn non-project personnel about traffic hazards associated with project-related activities. Dust suppression also would be used as appropriate to improve driver visibility during project-related activities such as rig or heavy equipment transportation events.

Dust suppression on roads would be accomplished by using water, magnesium chloride, enzymes, or other approved suppressants. Water requirements for dust suppression are described in the section below.

Water Use and Water Sources

Drilling and completion would require an average of approximately 72 acre-feet of water per year. Estimates are based on the reported use of approximately two acre-feet of water for each well and drilling 36 wells per year. Estimates of water use for dust suppression are based on ten trips with 4,200 gallon trucks per day for 100 days per year, or 12.8 acre-feet/year. An additional 10 trips per rig move could be required when moving drilling rigs in and out. Assuming an average of 36 wells drilled per year, an additional 6.4 acre-feet/year would be used for rig moves. Therefore, estimated annual water use for dust suppression would be 20 acre-feet/year and total annual water use for drilling and dust suppression would be 92 acre-feet/year.

Over the life of the project, it is currently estimated that approximately 75% of project water would be obtained from surface water sources. The remaining 25% of water needs would be supplied by municipal sources, private water wells in the field, recycled water, or other permitted sources. Surface water from Nine Mile Creek, Dry Creek, and Cottonwood Creek would be diverted for use after authorization by the State of Utah and by permission of the water right holder(s). It is assumed that there would be maximum of four water wells on each of the three mesas in the project area for a total of 12 water wells. Water wells would be sited on well pads. Some re-use of produced water would occur. After a well is drilled, produced water from a producing well could be used for drilling and completion of other wells. Rights to ground water would be obtained through application to the Utah State Division of Water Rights. Water from all of these sources would be distributed by truck to the point of use.

<u>Hazardous Materials and Solid Waste</u>

Upon completion of drilling, drilling fluids would be stored in the reserve pit and evaporated. Chemicals on the Environmental Protection Agency's *Consolidated List of Chemicals Subject to Reporting Under Title III of the Superfund Amendments and Reauthorization Act of 1986* (SARA) that may be used or stored in quantities of over 10,000 pounds would be used in their entirety or disposed of appropriately. In the course of drilling, BBC and/or its contractors may store and use diesel fuel, sand (silica), hydrochloric acid, and carbon dioxide (gas), all described as hazardous substances in 40 C.F.R. Part 302, Table 302.4, in quantities exceeding 10,000 pounds. In addition, natural gas condensate and crude oil, described as hazardous substances in 40 C.F.R. Part 302, Table 302.4, may be stored or used on-site in quantities exceeding 10,000 pounds. During production operations, triethylene glycol, ethylene glycol mix (50 percent), and methanol, all described as hazardous substances in 40 C.F.R. Part 302, Table 302.4, may be stored or used on-site in quantities less than 10,000 pounds. Small quantities of retail products (paint/spray paint, solvents [e.g., WD-40], and lubrication oil) containing non-reportable volumes of hazardous substances may be stored and used on-site at any time. No *extremely* hazardous substances, as defined in 40 C.F.R. Part 355, would be used, produced, stored, transported, or disposed of in association with the Proposed Action.

Any spills of oil, gas, salt water, or any other potentially deleterious substances would be cleaned up and removed as soon as practicable to an approved disposal site, most likely in Duchesne. Prior to dirt work to restore disturbed areas, all solid wastes and refuse would be removed and placed at approved land fills in Carbon, Duchesne and Uintah Counties. About two, two-ton truck loads of waste are generally created during drilling and completion of each well.

Drilling and production operations would require an emergency Spill Prevention, Control, and Countermeasure (SPCC) Plan, as appropriate, that outlines the methodology to be used in the event of a spill. The SPCC Plan describes spill control, reporting, and cleanup procedures to help prevent impacts to surface and subsurface waters. A typical SPCC Plan is attached as Appendix B. Produced liquid hydrocarbons and condensates would be stored in tanks surrounded by a secondary containment berm of sufficient capacity to contain a minimum of 1.1 times the storage capacity of the largest tank. All loading lines and valves would be placed inside the berm surrounding the tank or would utilize catchment basins to contain spills. The tanks would be emptied as necessary, and the liquids transported to market in Roosevelt or Altamont via trucks.

Workforce and Worker Housing

As shown in Table 4, up to 141 persons could be employed and actively working in the project area during the construction and drilling phases if six rigs were operating in the area. Additional workers would be needed when new sections of the pipeline gathering system are under construction. This would occur periodically as new parts of the area are developed. Average workforce requirements for installation of a section of pipeline would be 15 persons. Employment for production operations and well service would depend on the number of producing wells at any one time. The number of operations and service personnel would grow over time as the number of producing wells increased but would amount to a small percentage of the total workforce.

**Table 4. Average Workforce by Activity**

| Activity | Earthwork* | Drilling | Completion | Total |
|---|---|---|---|---|
| **One Rig** | 4 | 12 | 15 | 35 |
| **Six Rigs** | 12 | 72 | 45 | 141 |

* Earthwork includes construction of well pads and associated access roads, pipelines, and compressor stations.

Approximately ninety percent of the workforce associated with the project would be stationed in the area of Vernal and Roosevelt, Utah. The remainder would be located in Carbon County, primarily in Wellington and Price, Utah. County Road 53 (Nine Mile Canyon) would be the primary access from Wellington, whereas Gate Canyon to its junction at Nine Mile Canyon would serve as the access from Vernal. Up to five temporary trailers to house the well pad supervisor, geologist, tool pusher, and rig hands may be on each drilling location during drilling and completion. No work camps or permanent living facilities would be used on Federal lands but BBC anticipates constructing a work camp on State or private land within the project area. Facilities would include enough portable housing units for up to 30 workers.

Self-contained sanitary waste facilities (i.e., portable toilets) would be used for all drilling locations and the work camp. A commercial supplier would install and maintain the facilities and be responsible for removing sanitary waste. Up to three loads of sanitary waste per month would be removed from each site. Upon completion of operations, or as required, these facilities would be removed and the contents disposed of in an approved sewage disposal facility also in Carbon, Duchesne and Uintah Counties. Waste facility locations would be reclaimed within six months after removal of facility equipment.

Surface Disturbance

Surface disturbance anticipated under the Proposed Action is shown in Table 5. Initial disturbance for construction of well pads, roads and other facilities is shown as "Temporary" disturbance, totaling up to 1,981 acres for the entire project. Those portions of the disturbance associated with dry holes, well pad reduction after drilling, access road ROW reclamation, and surface pipelines would be reclaimed within one to two growing seasons following disturbance. What remains would be a "Long-Term" disturbance of up to 808 acres for the life of the project.

**Table 5. Surface Disturbance[1] Anticipated for the Proposed Action.**

| Project Feature | Disturbance (acres) | |
|---|---|---|
| | Temporary | Long-Term |
| Well Pads | 1,375 | 500 |
| Roads | 538 | 269 |
| Pipelines[2] | 29 | 0 |
| Compressor Stations | 15 | 15 |
| Aggregate Barrow Areas (Quarries) | 6 | 6 |
| Water Management Facilities | 18 | 18 |
| **Total** | **1,981** | **808** |

[1] It is important to note again that the 500 well pads illustrated on Figure 2 should be considered statistically derived, theoretical, and conceptual maximums that likely would not be approached by the actual development. However, for the purposes of impact analysis, all 500 well pad locations and their associated access roads have been used for surface disturbance calculations.
[2] Pipelines installed independent of access roads.

## Permitting and Other Regulatory Requirements

Table 6 shows those permitting actions that would be required at the appropriate times as the field is developed. Each permitting action would be based on separate applications for different stages of the project.

**Table 6. Major Federal, State, and Local Permits, Approvals, and Authorizing Actions for the Proposed Action.[1]**

| Agency | Permit, Approval, or Action | Authority |
|---|---|---|
| Office of the President of the United States | Protection and enhancement of the cultural environment | Executive Order 11593 |
| | Floodplains management | Executive Order 11988 |
| | Protection of wetlands | Executive Order 11990 |
| | Environmental Justice | Executive Order 12898 |
| | Indian sacred sites | Executive Order 13007 |
| | Invasive species | Executive Order 13112 |
| | Protection of migratory birds | Executive Order 13186 |
| | Trails for America in the 21st century | Executive Order 13195 |
| | Preserve America | Executive Order 13287 |
| Bureau of Land Management (BLM) | Permit to drill, deepen, or plug back on federal onshore lands (APD/Sundry process); authorization for flaring and venting of natural gas on federal lands; plugging and abandonment of a well on federal lands | *Mineral Leasing Act of 1920* (30 *United States Code* [U.S.C.] 181 et seq.); 43 C.F.R. 3162 |
| | Rights-of-way grants and temporary use clearances on federal lands | *Mineral Leasing Act of 1920*, as amended (30 U.S.C. 185); 43 C.F.R. 3180; FLPMA (43 U.S.C. 1761 - 1771); 43 C.F.R. 2880 |
| | Antiquities and cultural resource clearances on BLM-managed land | *Antiquities Act of 1906* (16 U.S.C. Section 431-433); *Archaeological Resources Public Protection Act of 1979* (16 U.S.C. Sections 470aa - 470*ll*); 43 C.F.R. 3; *National Historic Preservation Act of 1966* (NHPA) and Advisory Council Regulations (36 CFR 800); *American Indian Religious Freedom Act of 1978*, as amended (42 USC 1996 et seq.)*; Native American Graves Protection and Repatriation of 1990*, as amended (25 USC 3001-3013); and implementing *regulations* |
| | Approval to dispose of produced water on BLM-managed land | *Mineral Leasing Act of 1920* (30 U.S.C. 181 et seq.); 43 C.F.R. 3164; *Onshore Oil and Gas Order No. 7* |

| Agency | Permit, Approval, or Action | Authority |
|---|---|---|
| U.S. Army Corps of Engineers (COE) | Section 404 permits and coordination regarding placement of dredged or fill material in area waters and adjacent wetlands | Section 404 of the *Clean Water Act of 1972* (40 C.F.R. 122 - 123, 230) |
| U.S. Fish and Wildlife Service (USFWS) | Coordination, consultation, and impact review on federally listed threatened and endangered (T&E) species and other federally protected species | *Fish and Wildlife Coordination Act* (16 U.S.C. Sec. 661 et seq.); Section 7 of the *Endangered Species Act of 1973*, as amended (16 U.S.C. et seq.); *Bald Eagle Protection Act*, as amended (16 U.S.C. 668-668dd); *Migratory Bird Treaty Act* (16 U.S.C. 704) |
| U.S. Environmental Protection Agency (EPA) | Spill Prevention Control and Countermeasure Plans (SPCCPs) | 40 C.F.R. 112 |
| | Regulation of hazardous waste treatment, storage, and/or disposal | *Resource Conservation and Recovery Act* (42 U.S.C. Section 6901) |
| U.S. Department of Transportation | Control of pipeline maintenance and operation | 49 C.F.R. 191 and 192 |
| Utah Division of Wildlife Resources | Coordination on impacts to wildlife and state-sensitive species | |
| Utah Department of Environmental Quality, Division of Water Quality | Storm water discharge permits | |
| Utah Department of Environmental Quality, Division of Air Quality | Approval order for compressors | |
| Utah Department of Transportation | Conformance with applicable size and weight limits for trucks | |
| | Permits for utility crossings of state roads | |
| Utah Division of Water Rights | Stream alteration permits | |
| | Change in use of water rights. | |
| Utah State Historic Preservation Office | Consultation for cultural resource inventory, evaluation, and mitigation | |
| Utah School and Institutional Trust Lands Administration | Right-of-way easements on state sections | |
| Utah Division of Oil, Gas, and Mining | Permits for oil and gas wells | |
| Carbon County | County bond | |
| | Permits for use of county roads for heavy commercial purposes | |

[1] This list is intended to provide an overview of the key regulatory requirements that would govern project implementation. Additional approvals, permits, and authorizing actions may be necessary.

## Figures

**Figure 1. General Project Location**

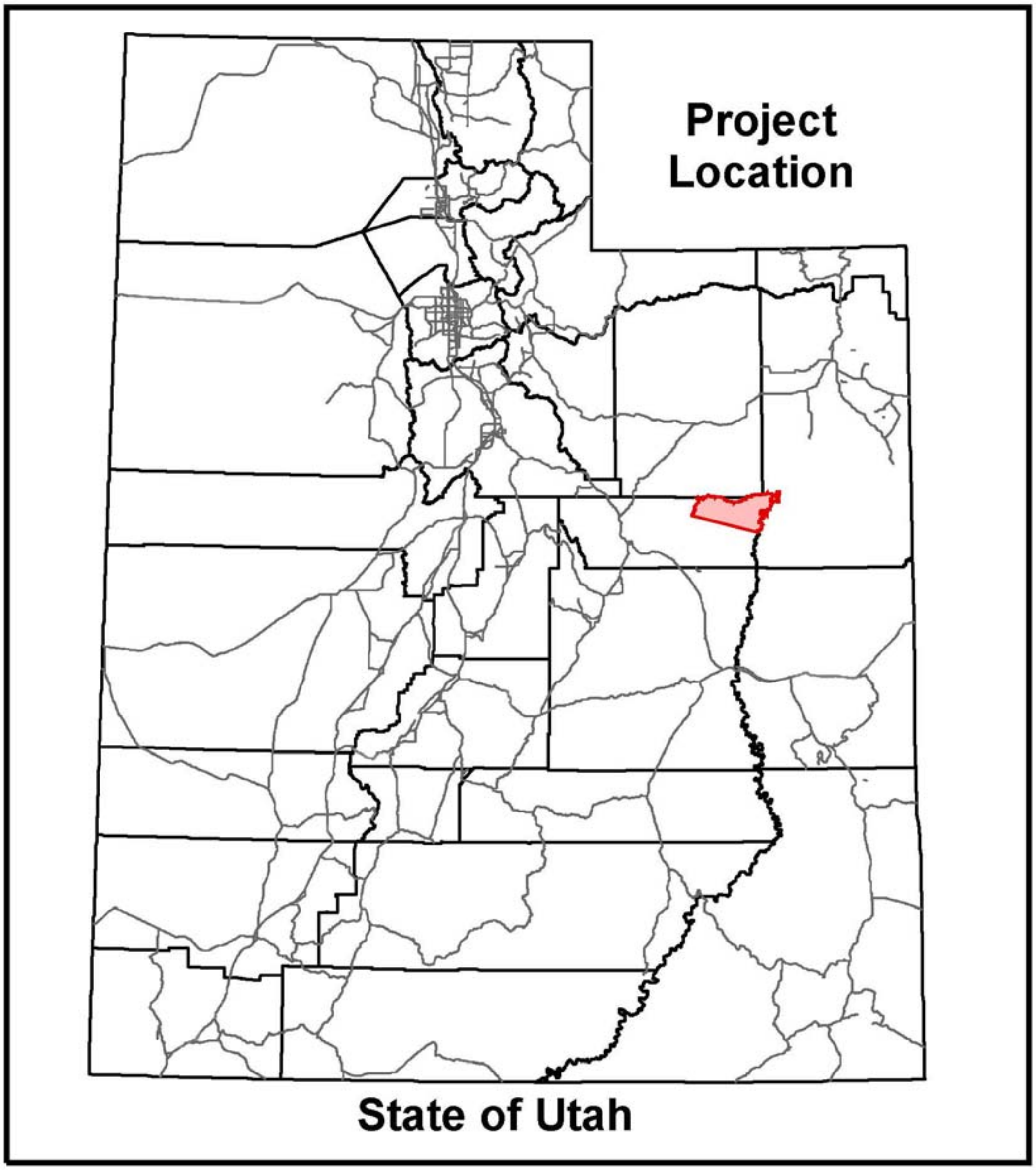

**Figure 2. Proposed Action**

See attached.

**Figure 3. Typical Stratigraphic Section**

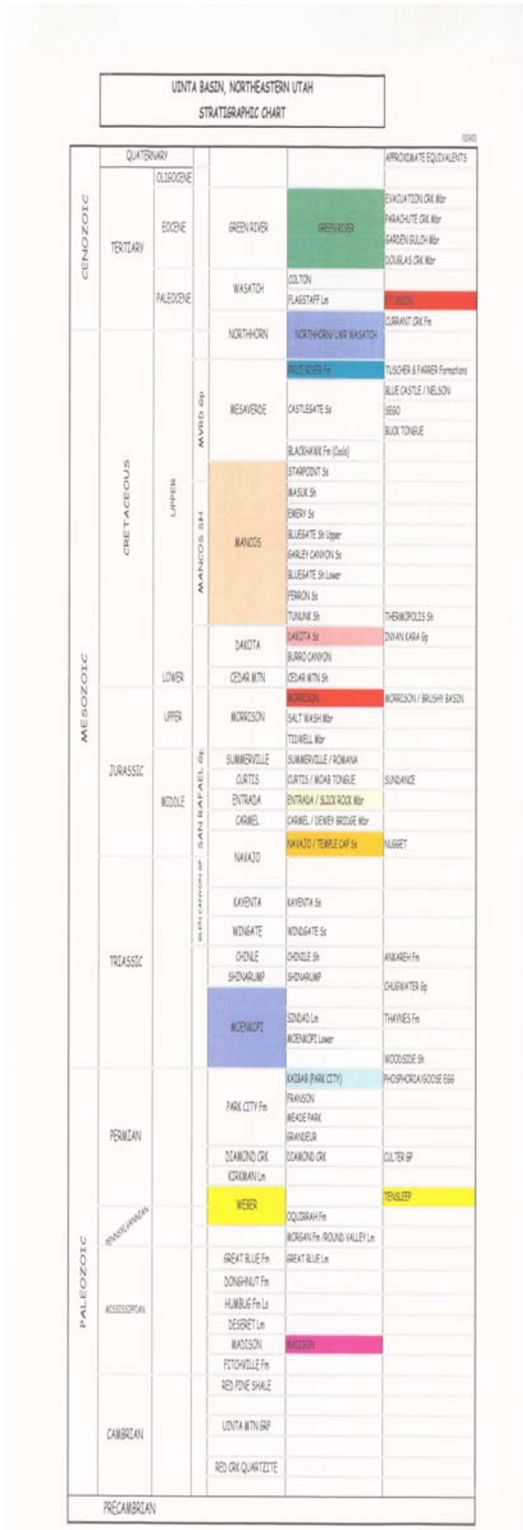

**Figure 4. Typical Well Pad Layout During Drilling**

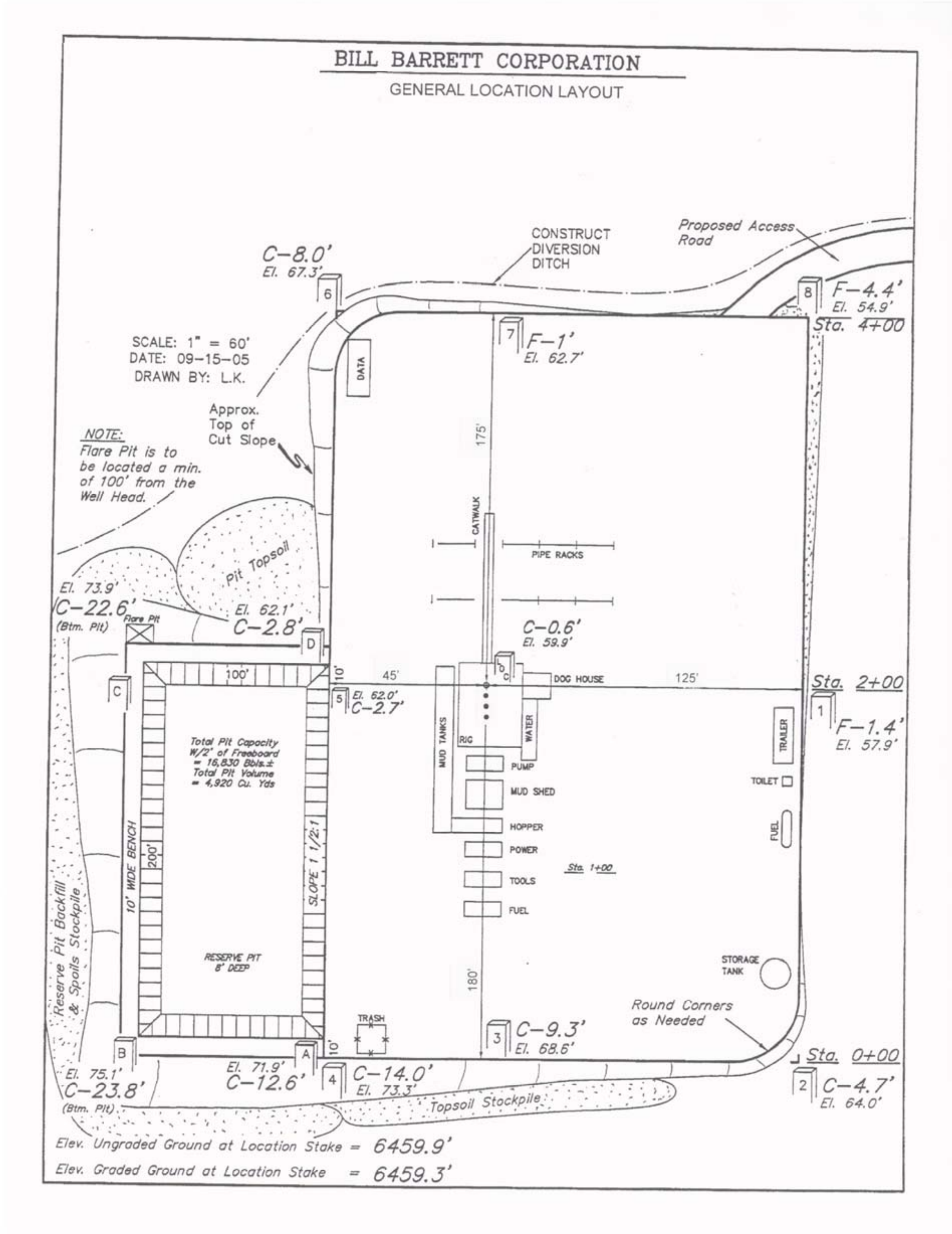

**Figure 5. Typical Road Cross Section**

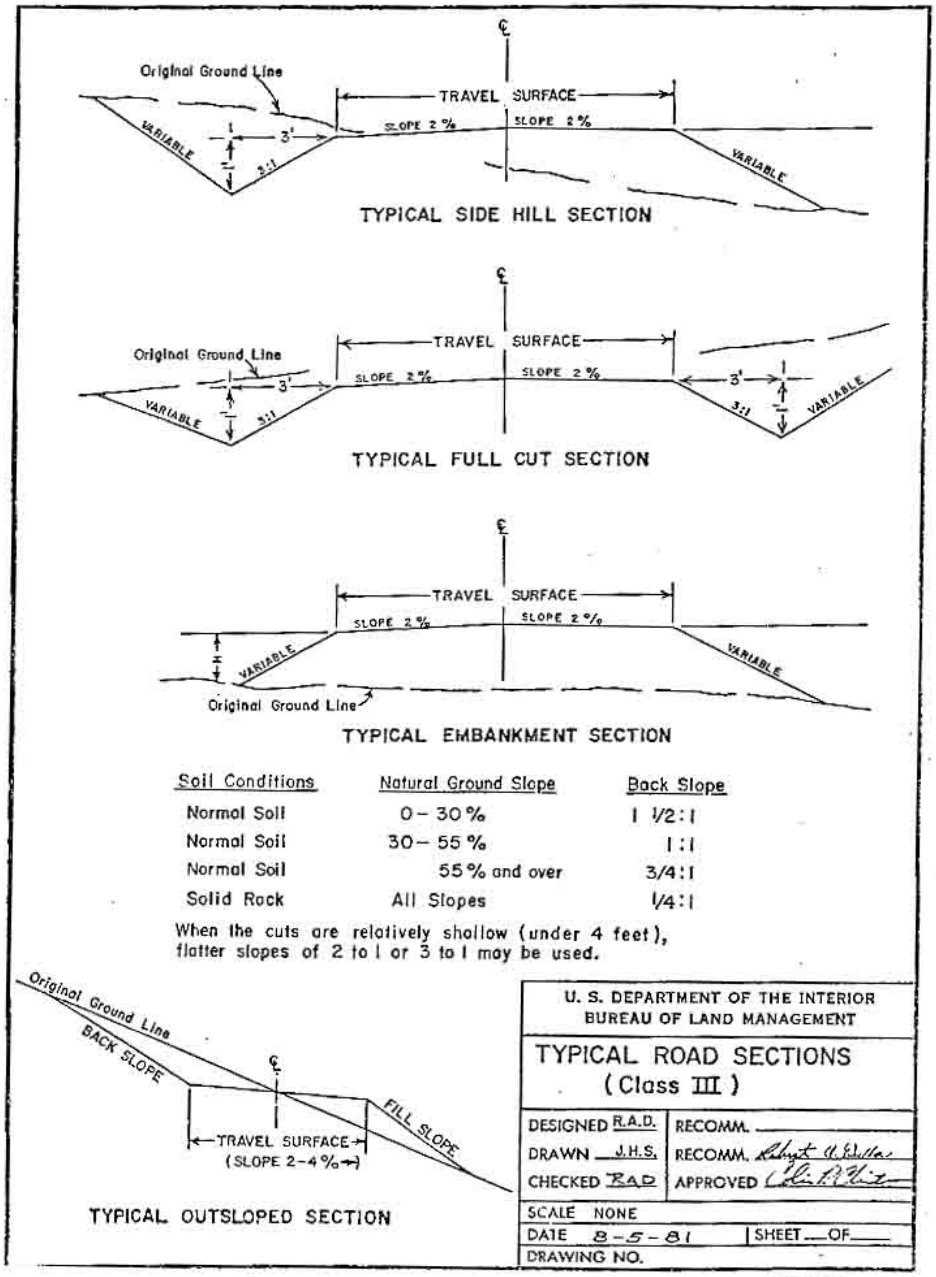

**Figure 6a. Well Bore Schematic**

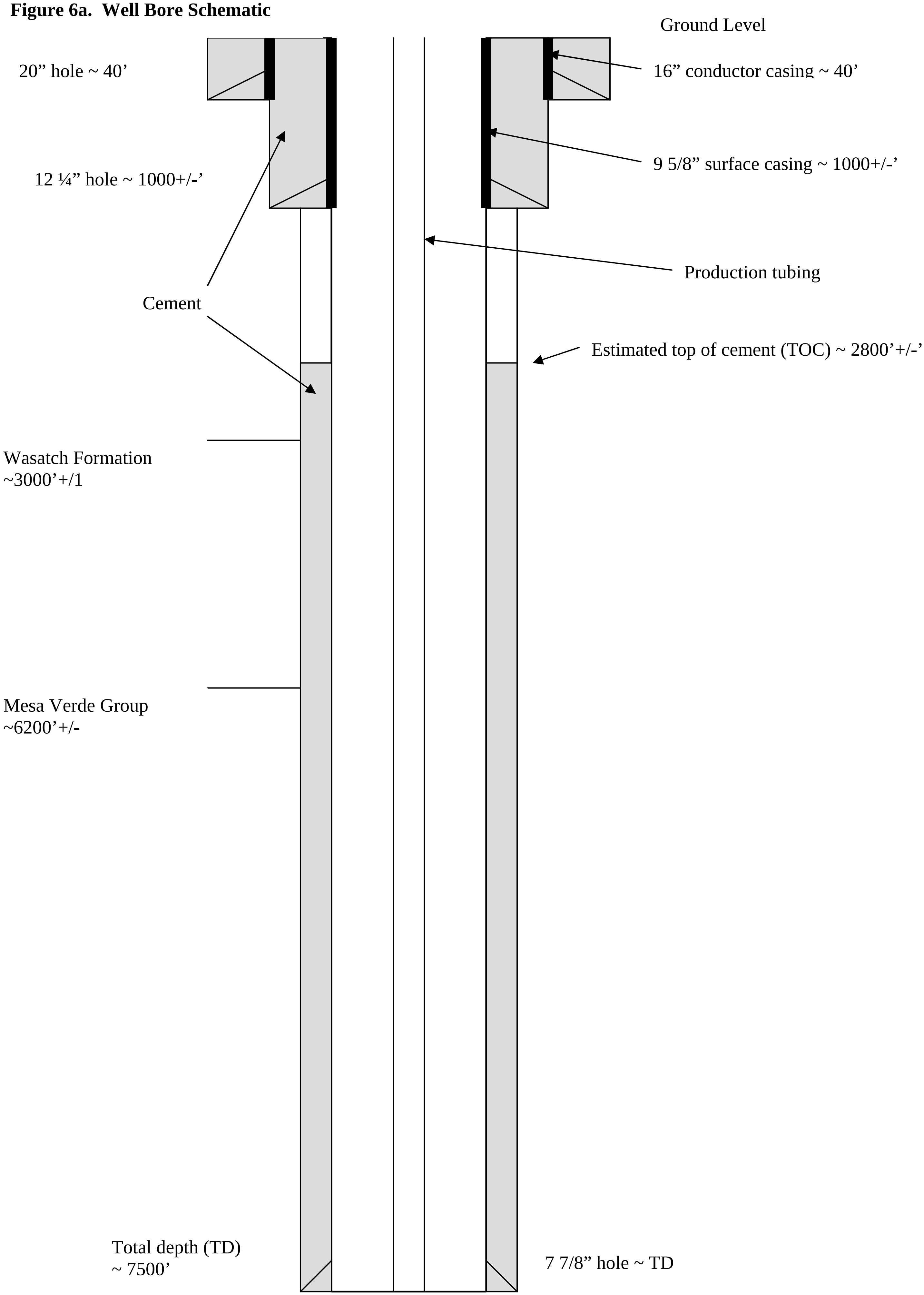

**Figure 6b. Well Bore Schematic – Deep Well**